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THE MEDICAL EXAMINER SYSTEM IN RHODE ISLAND

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The recent sudden withdrawal of a large proportion of the physicians of this country from civilian practice makes it imperative for those who remain to survey their rapidly mounting responsibilities with a view to making such readjustments as may be necessary for the continuance of certain essential medical services. The current need for everyone to make his efforts count the most requires first that an inventory of civilian needs be taken and second that an attempt be made to satisfy those needs with the greatest possible efficiency. One important form of public medical service that is already threatened by the shortage of qualified physicians is that discharged by the office of medical examiner.

What are the essential public services for which the office of medical examiner is responsible? The protection of public welfare requires a type of medical service which will insure (1) that deaths by homicide will not escape recognition, (2) that all pertinent medical evidence bearing on the circumstances and manner in which deaths by homicide have occurred will be obtained, and (3) that deaths which have resulted from preventable hazards to public health will be investigated. What aspects of the medical examiner system as it is presently constituted in Rhode Island militate against the achievement of these desiderata?

It should be borne in mind that the medical examiner system was infinitely superior to that of the county coroner even in the original form in which it was established almost 75 years ago in the Commonwealth of Massachusetts. Since that time it has undergone progressive modification and improvement as evidenced by the changes that were incorporated first in New York city, later in Essex County, New Jersey, and most recently in the state of Maryland. It is not inconceivable that still further improvements in the medical examiner system may be made.

According to Section 9, Chapter 11, of the General Laws of Rhode Island, "When a medical examiner has notice that there has been found or is lying, within his district, the body of a person who is supposed to have come to his death by violence, he shall forthwith repair to the place where such body lies and take charge of the same; and if, on view thereof and personal inquiry into the cause and manner of the death he deems a further examination necessary, he shall, upon being thereto authorized in writing by the attorney general, or by the mayor of the city or president of the town council where such body lies, make an autopsy . . ."

There are two serious defects in this law. One is that it is unwisely restrictive in its definition of the kinds of death to be investigated, and the other is that it denies the medical examiner the right to decide to what extent his medical investigation shall be pursued.

By restricting medico-legal investigations to deaths "supposed" to have resulted from violence the law excludes from investigation many which although they have occurred under suspicious circumstances and from obscure causes cannot be supposed to have resulted from violence. Among these there will be a certain number that have resulted from unnatural causes. They cannot be investigated if the law requires that there be positive evidence upon which to base a supposition of violence and yet the very absence of positive evidence of any kind may constitute an adequate medical reason for suspecting that death may have been due to violence.

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Every physician knows that there are many forms of fatal chemical and mechanical injury that leave no external evidence of their occurrence and that may be sustained in circumstances such that the investigator has no positive knowledge upon which to base suspicion. It would be far better in the interests of public welfare if medical examiners were given greater latitude in deciding which deaths should be investigated. The New Jersey statute is an excellent one in this respect and according to it, "When, in the county, any person shall die as a result of violence or by casualty or suicide, or suddenly when in apparent health, or when unattended by a physician, or within 24 hours after admission to a hospital or institution, or in prison, or in a suspicious or unusual manner, or under any of the above circumstances in any institution located in the county maintained in whole or in part at the expense of the state or the county, the police department of the municipality in which he died, the superintendent or medical director of the institution in which he died, or the physician called in attendance, shall immediately notify the office of the chief medical examiner of the known facts concerning the time, place, manner and circumstances of the death. Immediately upon receipt of such notification the chief medical examiner, or an assistant medical examiner, shall fully investigate the essential facts. If necessary he shall go to the dead body and take charge thereof."

Attention has been called in a preceding paragraph to the fact that the law should place the responsibility for authorizing a medico-legal autopsy with the medical examiner rather than with a non-medical official. If a medical examiner is sufficiently trustworthy to merit holding that office it should be assumed that he is sufficiently intelligent to determine the extent to which it is necessary to investigate any given death in order to acquire the true facts relating to it. If on investigation of such a death the medical examiner is of the opinion that an autopsy should be performed in the interests of public welfare he should be empowered by law to proceed on his own initiative. If he cannot be entrusted with such responsibility he should not be medical examiner. One thing is certain and that is that the medical examiner is likely to be more competent to pass on the significance of the medical evidence and on the need for additional evidence than is the mayor, the president of the town council, or even the attorney general.

Another serious shortcoming of the laws of Rhode Island so far as they apply to the medical examiner's office is the manner in which they provide for the selection of medical examiners. The medical examiner system of Rhode Island is part of a spoils system in that the law provides that, "The attorney general shall appoint medical examiners . . . and each medical examiner shall hold office at the pleasure of the attorney general." Under this law the selection of medical examiners is bound to be influenced to a considerable extent by the political qualifications of the candidates. With each political change in state government a certain number of experienced examiners are almost sure to be replaced by persons who are both inexperienced and incompetent. There has been a growing recognition throughout the country of the fact that public servants whose duties are technical and non-policy forming should be selected under some form of the merit system. Only in this way is it possible to avoid those periodic dislocations of highly specialized public service that are bound to occur if the selection of persons responsible for such services is based on their political rather than on their professional qualifications.

There are two ways by which the merit system may be applied to the selection of medical examiner. One is by making such appointments from a classified civil service list on a basis of competitive examination and the other is by requiring that appointments be made by a self-perpetuating non-political commission of experts. The former system is employed in the city of New York whereas the latter is employed for the selection of medical examiners in the state of Maryland. Each system has its merits and faults but either system is infinitely preferable to the system currently in operation in Rhode Island.

An effective medical examiner system must provide for two types of investigators. One should be a district, county, or local examiner who is responsible for the initial phase of the investigation of any death thought to be medico-legal. It should be required that all deaths meriting investigation should be reported to him for certification. He should acquire such information as he considers pertinent and should view the body. If in his

opinion or in the opinion of the attorney general an autopsy should be performed it should be required by law that a competent pathologist be called. The medical examiner system of Rhode Island should provide for at least one official medico-legal pathologist and as many district or county medical examiners as are necessary to conduct preliminary investigations.

At present the laws of Rhode Island require the appointment of 31 medical examiners and 3 associate medical examiners. This would indicate that there is in the neighborhood of one examiner for each 21,000 inhabitants. The death rate in New England is approximately 11 per 1000 so that the average annual number of deaths per medical examiners' jurisdiction in Rhode Island is probably in the vicinity of 230 per year. If the medical examiners of Rhode Island restrict their investigations to deaths of persons supposed to have died of violence the average number of investigations per medical examiner should be about 23.

It can be assumed that the greater the experience of any individual medical examiner and the more frequently he is called upon to conduct medico-legal investigations the more likely he is to be proficient in his work. This being the case, it would appear that the medical examiner service of Rhode Island would be discharged more effectively if there were fewer medical examiners. In communities in which medical examiners serve on a full-time basis it has been found that one examiner per 200,000 is required. Four full-time examiners could in all probability provide adequate service for the state of Rhode Island. One full-time medical examiner's pathologist and 10 part-time county or district examiners could undoubtedly provide a more efficient and less expensive service than is now available.

FLUID ADMINISTRATION

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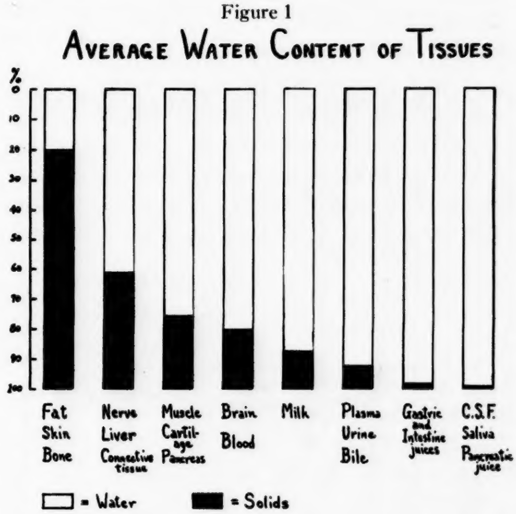
The human body is a complex mixture of water, salts and organic substances maintained in form by rigid structural units and covered with a relatively waterproof coating. In the presence of a variable environment with extremes of temperature, clothing, air currents, food, drugs and disease, the maintenance of fluid and electrolyte balance within the normal limits of health is a remarkable process. Fortunately the body possesses many physiological mechanisms for the maintenance of this balance and only rarely is medical aid necessary as a supplement. Like all medical treatment, replacement therapy must be on a sound physiological basis or definite harm will result.

Body Water

Any discussion of fluid therapy must be primarily a study of body water. Peters of Yale has an excellent book on this subject.[1] Body tissues vary from 20% water in fat to 99% in spinal fluid. Blood plasma has 92% water and whole blood about 80%.

Figure 1

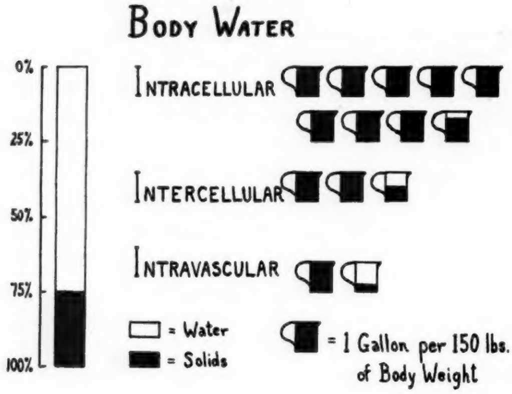


A rough average is that three-quarters of body weight is water, or a normal 70 Kg. man contains about 50 quarts of water. This water is divided in two phases generally spoken of as intracellular

*Delivered before the monthly meeting of the W. W. Keen Club, Sept. 14, 1942.

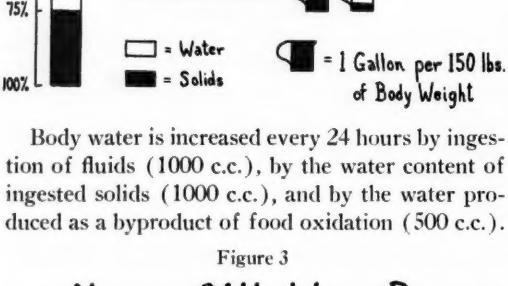
water (75%) and extracellular water (25%). The latter may be again divided into intercellular water of the tissues (17%) and intravascular water of the blood (8%). Thus our average normal man will have about 35 liters of intracellular water, 10 liters of intercellular water and about 5 liters in his vascular system.

Figure 2



Body water is increased every 24 hours by ingestion of fluids (1000 c.c.), by the water content of ingested solids (1000 c.c.), and by the water produced as a byproduct of food oxidation (500 c.c.).

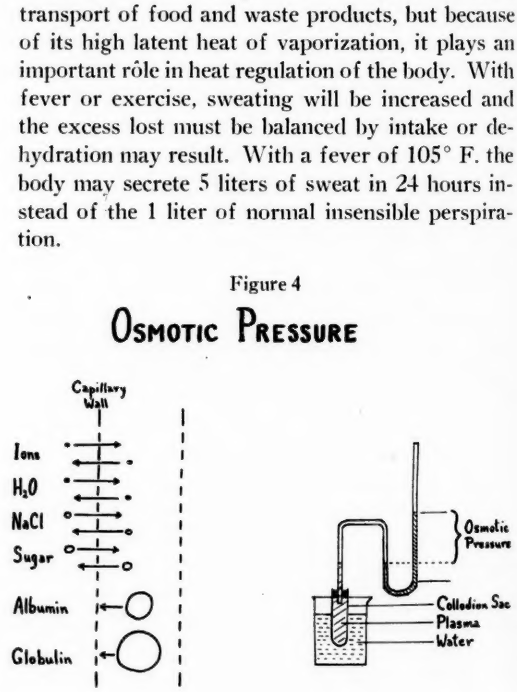
Figure 3



Body water is decreased every 24 hours by the excretion of urine (1000 c.c.), secretion of sweat (1000 c.c.), loss in expired air (350 c.c.), and loss in feces (150 c.c.). Thus we see that normally about 2500 c.c. of water are added to and the same amount lost from the body in each 24 hours. (Fig. 3). During growth there is water retention in the body. A decrease in intake is counterbalanced by less excretion particularly by the kidney, but this mechanism can take care of only about 700 c.c. of decrease since a definite volume is required for concentrated excretion of waste products. When output exceeds intake dehydration will result. Water can be withdrawn from cells for vital processes, but a total loss of about ¼ of the body water is inconsistent with life. If on the other hand intake is increased the kidney responds by excreting a dilute urine. Such diuresis can balance quite excessive intake for short periods, but since the kidney cannot excrete distilled water alone, a dilution of body electrolytes may occur. When this is not balanced by intake of salts, water intoxication and death may result.

Water acts not only as the fluid medium for transport of food and waste products, but because of its high latent heat of vaporization, it plays an important rôle in heat regulation of the body. With fever or exercise, sweating will be increased and the excess lost must be balanced by intake or dehydration may result. With a fever of 105° F. the body may secrete 5 liters of sweat in 24 hours instead of the 1 liter of normal insensible perspiration.

Figure 4



Osmotic Pressure (Fig. 4)

In order to understand water balance we must discuss the electrolyte and other substances dissolved in the water and how these act with respect to the body and cell membranes. Dilute solutions of molecules act like the molecules of a gas and exert a pressure on limiting membranes called osmotic pressure. Thus a solution of sugar, salt, or protein, when confined by a membrane that will allow water but not the solute to pass, and when surrounded by pure water, will allow water to enter the solution until it raises a column of liquid equal to the osmotic pressure. If the membrane is permeable to both solvent and solute no osmotic pressure will be exerted and diffusion of both will occur until the concentrations of both are the same within and without the membrane, or the fluids on both sides are *isotonic*.

How does this apply to the body? The walls of the capillaries are permeable to salts, glucose and water but not to the larger molecules of serum proteins. The latter exert an osmotic pressure and so tend to draw water into the capillaries. Blood pressure within the capillaries tends to shove water out through the vessel wall. At the arterial end of the capillary water and salts are going out into the tissue spaces, but at the venous end where hydrostatic pressure is less than the osmotic pressure, water and salts are entering the capillary. (Fig. 5). Normally this loss and gain balances. With a fall in serum protein and the same blood pressure more water is lost than regained and edema results. The picture is further complicated by changes in permeability brought about by tissue damage, tissue anoxia, and histamine, when the capillary may be permeable to protein and lose its ability to take on water because osmotic pressure of the proteins no longer exists.

Cell membranes of man, like the capillaries, are impermeable to proteins, permeable to most ions and small molecules, but they are in general not permeable to sodium and potassium. Thus sodium is found almost entirely outside cells and potassium almost entirely inside cells. For this reason sodium salts given by mouth tend to stay extracellular and attract water out of the cells, producing or aggravating edema, and any degree of loss of sodium from the body will cause a similar loss of extracellular fluid.

Blood Volume (Fig. 6)

Blood is the only phase of body water which can be used to study water balance, unless the impractical long-term balance studies of intake and excretion are used. The total volume of blood in the normal body can be determined by injection of dyes or by using the affinity of hemoglobin for carbon monoxide. Our 70 Kg. normal man has been found to have a total blood volume of about 6300 c.c. made up of 2800 c.c. of red cells and 3500 c.c. of plasma. When fluid is injected and blood volume raised, the disturbance is countered by an increase in excretion and passage of fluid into tissue spaces. Intravenous injection of a crystalloid isotonic solution changes normal blood volume only for a short while and restoration is complete in about half an hour. Loss of blood volume as in hemorrhage is also balanced by withdrawal of fluid from tissue spaces after an interval of a few hours.

Figure 5

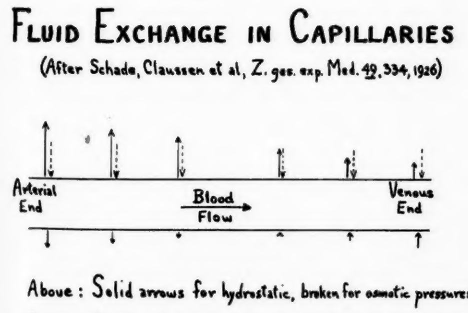
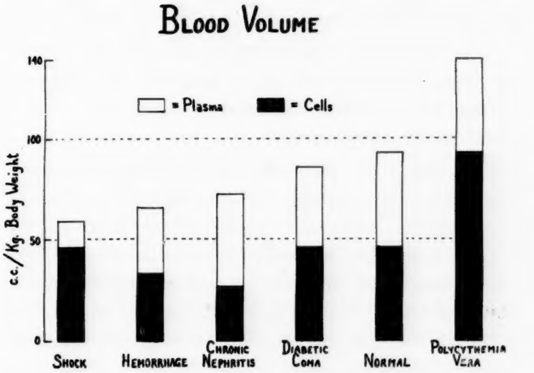


Figure 6



Other measures of changes in intravascular fluid which are of use are red blood count, hemoglobin, serum proteins and the volume of packed red cells (hematocrit). Unlike the determination of blood volume these values are relative and not absolute. Just after hemorrhage the values for the above are normal though total blood volume is reduced. Later the hemoglobin, hematocrit and protein will be reduced when the loss is replaced by tissue fluids. In shock there is a loss of plasma into tissue spaces. Blood will then show increased hemoglobin, red count and hematocrit while protein will be unchanged. In dehydration due to water loss all four will be increased. One must remember that values so obtained are only relative and must be interpreted against an often unknown value before the event in question. If run at intervals they are of great help in following and treating disturbances of water balance.

Acid-Base Balance

Body energy is derived primarily from oxidation of food stuffs. Oxidation yields a host of acidic substances yet the chemistry of cells and fluids is such that only the most minute changes in acidity take place. There are several mechanisms for combatting acidity:

1. *Respiration, where one of the chief products of oxidation is given off as the gas CO_2.*

2. *The buffer systems of the blood and tissue which allow minimum change in acidity for large increases in acid.*

3. *The manufacture of ammonia by the kidney so that acids can be excreted as ammonium salts to conserve sodium.*

4. *The ability of the kidneys and sweat glands to excrete more acid than base as necessary.*

5. *The ability of the tissues normally to oxidize organic acid by-products or resynthesize them to non-acidic chemicals (pyruvic acid → $CO_2 + H_2O$, lactic acid → glycogen).*

The base of the extracellular fluids is mainly sodium, and normally the amount of this varies only slightly in blood. It is combined mainly with bicarbonate and chloride, having small amounts combined with phosphate, sulfate, organic acids and proteins. If less than the normal amount of base is received by the body the kidney saves it and excretes ammonia instead, if more is received it is selectively excreted. Only when changes are very large are the mechanisms inadequate and alkalosis* or acidosis* result.

For convenience chemists designate the degree of acidity of a fluid as its pH, which is a simple figure, say 7.3, the negative logarithm of the hydrogen ion cencentration (which is 4.7×10^{-8} or 0.000,000,047 for a pH of 7.3).

$$pH = -\log [H+]$$

An absolutely neutral solution has a pH of 7.0, those with a pH less than 7.0 are acid, and those with a pH greater than 7.0 are alkaline. Blood is always slightly alkaline; even in severe states of acidosis the pH is greater than 7.0.

An example of a buffer system which occurs in blood is $NaHCO_3$ and H_2CO_3. Chemistry teaches us that pH will vary as the ratio of the concentrations of the constituents of a buffer.

$$[H+] = K\frac{[HA]}{[BA]}$$

$$-\log [H+] = -\log K - \log\frac{[HA]}{[BA]}$$

$$pH = pK + \log\frac{[BA]}{[HA]}$$

(where HA is the acid part and BA the basic part of the buffer system).

For blood plasma this becomes

$$pH = pK + \log\frac{[NaHCO_3]}{[H_2CO_3]}$$

The value of the constant pK has been determined as 6.1 so that

$$pH = 6.1 + \log\frac{[NaHCO_3]}{[H_2CO_3]}$$

or pH equals 6.1 plus the logarithm of the ratio of blood bicarbonate (CO_2 combining power) divided by the dissolved CO_2 (CO_2 tension of the alveolar air). The bicarbonate buffer system is the most important of several systems. For brevity and simplicity we will omit discussion of the others and consider only this one.

With normal pH the ratio $\frac{[NaHCO_3]}{[H_2CO_3]}$ is approximately $\frac{20}{1}$. (Table I). An increase in the numerator of $\frac{[NaHCO_3]}{[H_2CO_3]}$ will increase pH and cause an alkalosis, and an increase in the denominator will decrease pH and cause an acidosis. If we feed $NaHCO_3$ by mouth a change to an alkalosis should

*Actually here and in the following paragraphs, the correct terms should be "alkalemia" and "acidemia", but "alkalosis" and "acidosis" have been misused enough to become common parlance.

Table I

States of Acid-Base Balance

		pH	CO_2 C.P. vol.%	Alveolar CO_2 mm	$\frac{[NaHCO_3]}{[H_2CO_3]}$
1. Normal Plasma		7.4	58	45	20
2. Alkali Excess	C	7.4	61	50	20
3. " "	U	7.5	70	45	25
4. CO_2 Deficit	C	7.4	53	40	20
5. " "	U	7.5	59	35	24
6. Alkali Deficit	C	7.4	35	24	20
7. " "	U	7.2	25	26	13
8. CO_2 Excess	C	7.4	68	50	20
9. " "	U	7.3	70	65	17

C = Compensated U = Uncompensated

result. Actually the body compensates slight changes by excretion of extra alkali through the kidney and by retaining CO_2 (H_2CO_3) so that the ratio is not changed and pH stays normal. In this instance we could have a high CO_2 combining power, yet a normal pH and a *compensated alkalosis* (Table I, number 2). If kidney function should be failing, the result would be a higher CO_2 combining power, a raised pH and an *uncompensated alkalosis* (Table I, number 3). Since blood base (Na) is combined with HCO_3^- and Cl^-, vomiting, by a loss of free HCl, would increase combined CO_2, and give rise to an alkalosis at first compensated by increased dissolved CO_2, later uncompensated when chloride is markedly depleted.

We can have an alkalosis also by a respiratory loss of dissolved CO_2 as in hyperventilation. At first H_2CO_3 will decrease and be compensated by excretion of some $NaHCO_3$ and replacement of some by Cl^- from the cells (Table I, number 4), later, compensation will be exceeded and the ratio $\frac{[NaHCO_3]}{[H_2CO_3]}$ and pH will increase (Table I, number 5). In the latter instance we can have a low CO_2 combining power and an increased pH or alkalosis.

Suppose we add acids to blood as the diabetic does when fat oxidation fails in the absence of insulin. These acids will require some base for neutralization. Less will be left for HCO_3^- and Cl^-. $NaHCO_3$ will tend to be lowered. If CO_2 combining power is low but the respiration decreases H_2CO_3 proportionately, pH will be normal and we have a *compensated acidosis* (Table I, number 6). Kidney excretion of the acids as ammonium salts will also tend to conserve base and prevent acidosis. When the reserves are exhausted, CO_2 combining power will be low and pH low in an *uncompensated acidosis* (Table I, number 7). Loss of base also causes dehydration.

In kidney diseases with marked nitrogen retention, the inability to excrete ammonium salts to conserve base, and the inability to excrete phosphates and sulfates, result in a loss of base and also less base from the lowered total to form $NaHCO_3$. Respiratory decrease of H_2CO_3 can compensate for a while but finally the ratio is decreased, pH and CO_2 combining power are low, and acidosis is present.

Respiratory acidosis may also occur as in emphysema or rebreathing. Here CO_2 piles up in the alveolar spaces. The increased H_2CO_3 of blood is compensated by more combination with base from cells and base made available by selective excretion of chloride by the kidney (Table I, number 8, but the process may continue to uncompensated acidosis with a high CO_2 combining power, a low pH and a lowered $\frac{[NaHCO_3]}{[H_2CO_3]}$ (Table I, number 9).

It should be noted that in the respiratory acidosis and alkalosis, the CO_2 combining power varies in the opposite direction to pH changes. Only in conditions where the fixed base (Na) is changed can CO_2 combining power be used as a measure of acidosis or alkalosis. Fortunately these are the ones most frequently encountered clinically.

Routes for Fluid Administration (Table II)

Man was intended to have fluid administered only by mouth. When possible this route should be used, and there seems little if any excuse for giving fluids by other routes when the oral route will suffice. Water taken by mouth is absorbed within an hour into the blood stream. Salts and food materials are absorbed with it partly by diffusion, partly by osmotic forces, and partly by chemical processes as in the absorption of fats. The intestinal epithelium will not pass unwanted materials such as sulfates and leaves unabsorbed excess materials of the diet such as calcium. It seems self-evident that

such things as serum proteins and red blood cells can be of little value given by mouth since they would be digested before absorption. The building materials for them (protein and iron) can be given instead with as good effect, but they have no value for emergency treatment.

Table II

Routes for Giving Fluids

Route	Discomfort	Volume Liters/Day	Concentrations	pH	Absorption Time, Hrs.
1. Oral	0	2-7	All	2-13	½-6
2. Rectal	++	1-2	Isotonic	4-11	1-8
3. Intramuscular	+++	<1	Isotonic	6-8	½-4
4. Intraperitoneal	+	1-3	Isotonic	6-8	2-48
5. Subcutaneous	++	1-3	Isotonic	6-8	½-24
6. Intravenous	+	2-8	All	4-11	0
7. Intraosseous	+	2-8	All	4-11	0

Administration of fluid per rectum is a route which has been neglected. Water, small molecules and salts are well absorbed, though protein, starch and complex molecules are not. Because of difficulties with retention the amounts which can be given are limited. All food and water have been supplied for as long as two months by rectum, and nitrogen balance maintained.[8]

Other more direct routes are used when quicker results are desired or when the oral route is not of use in vomiting, stomach resection, coma, etc.

The intramuscular route limits the amount of fluid given because of the relatively small amount of intracellular space in muscle. Absorption is fairly rapid for diffusible substances with small molecules. Only isotonic solutions should be given to avoid killing of the tissues.

Intraperitoneally considerably larger volumes may be given. Absorption is still good for diffusible molecules. Fluids given this way must also be isotonic or nearly so, to avoid damage to tissues, and the technique of administration may at times cause danger by puncture of a viscus.

The subcutaneous route was popular several years ago and is still used extensively in many hospitals. It is somewhat more painful than the venous route, and once again the fluids given must be nearly isotonic to avoid killing of tissue and sloughing. Absorption from the muscles, abdominal cavity or subcutaneous tissues depends on circulation and is only slightly faster than from the gastro-intestinal tract when circulation is adequate. Reactions are much less apt to occur than by the intravenous route, and for routine fluid administration, where time is not an important factor, the subcutaneous route is probably a second choice to oral therapy.

In some cases where time is an important factor, where non-diffusible substances are to be administered, or where non-isotonic solutions are needed, the intravenous route must be used. Veni-puncture is usually a simple procedure, there is a minimum of discomfort, absorption is not a point to consider, and with modern non-pyrogenic solutions intravenous fluid therapy has become quite the style. Wide ranges of temperature, pH, and concentration can be given at rates of less than 50 drops per minute without difficulty. The dangers of intravenous fluid therapy are few but not unimportant, the chief ones being the kind of fluid to give and the amount to give, as we shall see later.

Recently Tocantins and others at Jefferson Medical College[9] have advocated infusions via the bone marrow, using the sternum in adults and the tibia or femur in children. When venipuncture is difficult this route may have an important place. Non-diffusible constituents such as red cells or plasma proteins can be given. Aphysiological variations in concentrations of crystalloids or in pH should be avoided by this route.

Types of Fluids

Water—Can be used as distilled water or as tap water. Either may be given orally or rectally but should not be used by other routes.

Beverages—These include tea, coffee, milk, fruit juices, beer, wines and distilled liquors. The last, though sometimes low in actual water content, will supply more than their original volume of water when oxidized. The use of this group is almost exclusively oral, though some of them can be given rectally.

Crystalloids in water solution—The various strengths of salt and of sugar solutions are made particularly for parenteral administration. Such salt solutions as sodium and magnesium sulfates are used orally. Sulfates do not pass the intestinal epithelium and so attract water into the

intestine and act as cathartics, with resultant dehydration of the body. Sodium chloride solutions can be given by mouth with good absorption but they are usually made for injection. 0.85% to 0.90% NaCl is isotonic with blood, and a neutral solution. When injected intravenously it causes a temporary increase in blood volume, within a half hour diffuses out into tissue spaces. Unless a lack of it is present, it is excreted slowly, and until balance is attained it increases interstitial fluid. Large amounts will cause visible edema. Concentrations of NaCl as low as 0.3% may be given by vein. Such a solution is hypotonic. Since more water than salt is given, it supplies water to combat dehydration, plus the small amount of salt. It acts as a greater stimulus to the kidney than isotonic sodium chloride, has less tendency to form edema. Concentrations as high as 25% are also given. These are hypertonic solutions. In the veins they tend to draw water into the blood, until diffusion lowers the salt concentration, and thus they dehydrate tissues and stimulate kidney excretion. Both effects are temporary and eventually the salt diffuses into interstitial spaces where it withdraws water from the cells which it cannot enter.

Various modifications of the isotonic sodium chloride solution have been made to include other salts present in the body. Ringer's solution is a good example, containing magnesium, calcium and potassium salts as well as sodium chloride and bicarbonate, in isotonic solution. In the living body such additions are not necessary though they are essential for perfusion of isolated surviving tissues.

Salt solutions with special uses include the bicarbonate and other alkalinizing solutions for treatment of acidosis, and the acidifying solutions for diuresis and treatment of alkalosis. A 5% solution of $NaHCO_3$ is isotonic with blood. As pointed out above, its use will supply a lack of CO_2 combining power ($NaHCO_3$) in the blood and directly combat an acidosis. Other alkaline solutions of importance are Darrow's, which is a mixture of hydrochloric acid and sodium carbonate giving an isotonic solution of $NaHCO_3$ and NaCl, and M/6 sodium lactate which is isotonic. The latter supplies base for combination with CO_2 because the lactate part of the molecule can be oxidized by the body.

Because protein has a greater water-holding capacity at alkaline pH, acid salts are used to get rid of edema. Examples are ammonium chloride and calcium chloride. The latter can be used only in small amounts by vein with little effect and these are usually given by mouth. Hydrochloric acid can be given in dilute solution by vein but it is seldom used.

Sugar solutions are the second example of crystalloids in water. 5% dextrose is isotonic with blood and tissue fluid, and is the most commonly used of this class. Dextrose solutions diffuse somewhat more slowly than saline solutions, and after oxidation of the dextrose, supply water only. They do not form edema, and when dehydration is absent they cause marked diuresis to excrete the water given. Hypotonic glucose solutions are not used but hypertonic solutions are. The latter will draw water from tissues into blood more than hypertonic saline solutions, because of their slower diffusion, and will cause water to be excreted when the dextrose is oxidized, while saline tends to keep water in the intercellular spaces. Hypertonic sucrose solutions have a more lasting effect than dextrose solutions because the sucrose is not oxidized but must be excreted by the kidney.

Dextrose solutions are also used because they supply carbohydrate food, and spare fat oxidation which gives rise to acetone bodies, when oral food is not given.

Mixtures of saline and dextrose act as each would separately. Thus a 5% dextrose in 0.85% saline solution, which is hypertonic, will temporarily draw water into the blood to dehydrate the tissues and in time it will cause an increase in interstitial fluid as well as increased kidney excretion of water. Solutions of amino acids have been used to supply protein building materials. By vein they help to restore nitrogen balance in a fasting individual but they do not raise serum proteins appreciably.

Non-crystalloid substances in water—This group of non-diffusible substances are administered almost exclusively by vein, and help to draw water into the blood, or supply a lack of some intravascular constitment such as red blood cells.

Though we have spoken of isotonicity of crystalloids they exert no osmotic pressure on body membranes unless the membranes are semi-permeable.

The proteins of blood plasma ordinarily cannot pass the capillary wall and so exert an osmotic pressure which counterbalances the blood pressure and keeps the blood fluid within the vessels. Solutions of gelatin and of acacia in saline exert an osmotic pressure on capillary walls and have been used to restore water to the vascular tree from tissue spaces. Both of these have been developed to the stage where the former troublesome toxicities have been avoided and they have a place in therapy.[10] The ideal substance to use is human plasma, which is non-toxic if properly prepared, and will draw water into the blood stream by increasing the osmotic pressure of the blood. Both citrated plasma and serum from clotted blood are in general use today.

Plasma diluted with saline, when injected will not raise osmotic pressure unless it is extremely low, and the saline will tend to pass into tissue spaces. It could be used to supply protein for replacement, but would only aggravate edema.

Concentrated plasmas, developed by the dehydration of plasma to a powder, and resolution in less than the original volume of water, act best to raise osmotic pressure of the blood and withdraw water into the vascular tree.

Bovine plasma has been tried intravenously on animals[11] but it is quite toxic and as such cannot be used for humans. From abbatoirs several millions of gallons of blood per year could be collected, and investigations by Cohn of Harvard and others[12] indicate that we may be able to use part of this material. Serum or plasma proteins are of two general classes, albumins and globulins. The albumins have smaller molecules and therefore exert greater osmotic pressures per unit of weight than the large molecules of globulins. Preliminary experiments show that the globulins are the cause of all anaphylactoid reactions to serum of other species, while the albumins are non-toxic. Methods of separation are difficult but not impossible, and quite possibly we may soon be using solutions of bovine albumin in water in place of our present human plasma.

Transfusions of whole blood must be mentioned to complete our examples of parenteral fluids. Here we give the cellular elements of the blood as well as the proteins, and so are able to combat hemorrhagic tendencies, treat anemias and leukopenias when they are present, as well as treat disturbances of water balance when plasma is not available.

What Fluids To Use (Table III)

Let us take a few illustrative examples of the uses of fluids:

A diabetic in deep coma will require insulin therapy but also fluid therapy. During the development of coma there has been a loss of base from the body because of acetone body formation in excess of the normal, and with this base water has been lost. In the severe case base has been excreted from the blood after the kidney ability to form ammonia to conserve base had been exceeded. Sodium chloride has moved into the blood stream from tissue spaces, along with water, and water has moved out of cells partly because of the acidosis which decreases the water-holding power of the cell proteins, but also to supply the loss of water from intercellular spaces, caused by the hypertonicity of the blood (high concentration of sugar and serum proteins). Both intracellular and extracellular water are decreased and blood volume is low. We would give isotonic saline in large amounts to supply both base and water or we might give some 5% sodium bicarbonate with the saline to directly improve the acidosis. Especially with a failing circulation large amounts of alkali are dangerous, because they can give rise to pulmonary edema and cardiac edema. M/6 sodium lacate is somewhat safer though its effect on acidosis is delayed until oxidation takes place. Some people have suggested the use of plasma to restore the blood volume, but, unless infection or malnutrition have lowered serum proteins, this hardly seems indicated. There is quite enough sugar already present so none need be given. Definitely contraindicated are all hypertonic solutions including 5% dextrose in physiological saline. For the severe case, during the first 24 hours at least 3000 c.c. of physiological saline and at least 500 c.c. of M/6 sodium lactate should be given as well as adequate insulin to lower the blood sugar. Laboratory control of therapy, if it is available, should include initial blood sugar, B.U.N. or N.P.N., serum proteins, sodium chloride and CO_2 combining power, with the abnormal ones repeated until they are compensated. Should serum proteins be low, or heart failure be a factor, part of the sodium solutions will have to be replaced by 5% glucose in water, hypotonic saline, or plasma.

THE USE OF FLUIDS

Kind	Route	Effect on Blood Volume	Effect on Interstitial Fluid (Edema Formation)	Effect on Dehydration	Effect on Kidney Output	Effect on Acid-Base Balance	Effect on Nitrogen Balance
WATER	P.O.	+ 0	0	–	+ +	0	0
0·9% NaCl	I.V.	+ 0	+	–	+ –	0	0
5% DEXTROSE	I.V.	+ 0	0	– –	+	+	+
5% DEXTROSE IN 0·9% NaCl	I.V.	+ 0	+	+	– +	+	+
10% to 50% DEXTROSE	I.V.	+ +	– –	+ +	+	+	+
50% SUCROSE	I.V.	+ +	– –	+ +	+	0	0
10% to 25% NaCl	I.V.	+	+	+	+	0	0
5% $NaHCO_3$	I.V.	+ 0	+ +	–	+ –	+ + +	0
M/6 Na LACTATE	I.V.	+ 0	+	–	+	+ +	0
NH_4Cl	I.V.	+	–	+	+ + +	+	+
10% AMINO ACIDS	I.V.	+ 0	0	–	+	+	+ + +
10% GELATIN IN 0·9% NaCl	I.V.	+ +	–	+	+	0	+
10% ACACIA IN 0·9% NaCl	I.V.	+ +	–	+	+	0	0
CITRATED PLASMA	I.V.	+ + +	– –	+	+ +	+	+
DILUTE PLASMA	I.V.	–	+	–	+	+	+
CONCENTRATED PLASMA	I.V.	+ + + +	– – – –	+ + +	+	+	+
WHOLE BLOOD (CITRATED)	I.V.	+ +	0	–	+ 0	+	+

Table III

A case of *Nephritis with marked nitrogen retention* requires fluid therapy. The kidneys here cannot concentrate urine and an attempt must be made to supplement this defect. Dehydration of cells, even in the presence of edema, is present because of the acidosis. There is usually no deficit of base (sodium), only a redistribution leaving less in the form of $NaHCO_3$. While the body cells are dehydrated the blood volume remains normal (plasma volume may even be high if there is associated anemia), and the interstitial fluids are increased by enough usually to cause edema. Water should be given, base is not needed, and sodium salts which would increase edema should be avoided. Hypertonic solutions should not be used because of the cellular dehydration. 5% dextrose in water will be indicated, or if the patient can take fluids by mouth, water or milk should be given orally. Any sweating that can be produced will aid in excretion. However, in order to draw fluid out of the interstitial spaces, it will be necessary to increase the osmotic pressure of the blood by giving plasma or concentrated plasma. Transfusion of whole blood may be used if there is marked anemia. The acidosis should never be directly treated with bicarbonate or lactate unless there is respiratory embarassment. Decreasing the acidosis increases the tendency to edema and may cause fatal pulmonary edema, and also it may bring on tetany by decreasing the ionization of an already low serum calcium. If the patient cannot take fluids by mouth he should have at least 3000 c.c. of 5% dextrose in water daily. Laboratory control of therapy should include B.U.N., creatinine, sodium chloride, plasma protein and CO_2 combining power. If NaCl of serum is low because of vomiting not more than 1000 c.c. of normal saline per day may be given. Unless kidney (and sweat) excretion can be made to exceed the accumulation of nitrogenous products, the situation is hopeless.

A *post operative stomach resection* case cannot take fluids by mouth and should be given them. Here there has been some loss of blood and of sweat on the operating table. After several days without food by mouth a fall in serum protein may develop. To avoid dehydration and to keep up excretion, isotonic solutions are needed up to 3000 c.c. per day. With fever more will be necessary. Glucose will be needed to combat starvation acidosis, and sodium chloride to balance losses in sweat and urine, so we should use at least 1000 c.c. of isotonic saline and 2000 c.c. of 5% dextrose. The practice of giving 5% dextrose in normal saline is not good. This hypertonic solution, if given to an already dehydrated person, tends to draw water into the blood and increase the dehydration until the dextrose is oxidized or the salt has diffused out. This is true for all post-operative cases who are dehydrated. Laboratory control should follow B.U.N., serum proteins and sodium chloride and keep them from changing from the normal. Fluids and food by mouth should be restored as soon as possible.

A case of *severe hemorrhage* needs a restored fluid balance. In the absence of shock which will be considered next, there is a fall in blood volume which is restored by diffusion from the interstitial spaces and by splenic contraction. When the blood volume is restored the hemoglobin and proteins are diluted and there is a partial tissue dehydration. Whole blood administered here will restore both hemoglobin and proteins to near normal and allow the salts and water to return to their intercellular place. Laboratory control will follow hemoglobin and serum proteins and one must remember that immediately after hemorrhage neither are abnormal until dilution with tissue fluids has occurred.

Severe hemorrhage almost always leads to *shock* as do trauma and extensive burns. When blood volume falls far enough by loss of blood, or loss of plasma into tissue spaces as in traumatic shock and burns, the venous return is decreased, anoxemia develops in the tissues, the heart is speeded by reflex action but cannot get blood to pump out, blood pressure falls, anoxemia causes capillary dilatation and lessened permeability, blood pressure falls faster and a vicious circle is established. The direct attack is to restore the blood volume. Hypertonic crystalloid solutions do this temporarily by drawing fluid into the blood. Sugar solutions are a little better than saline solutions but neither have any lasting effect and relapse in a few hours is usual. Plasma or whole blood transfusions, or better still concentrated plasma, are more permanent and restore blood volume until there is further loss of fluid and protein from the vascular tree. Gelatin and acacia solutions are intermediate in effect between crystalloids and plasma. In an

emergency, plasma treatment of gross hemorrhage will prevent shock, and whole blood can be given later.

We can follow the development and course of shock by serial hemoglobin and protein studies of the blood. The normal process of recovery from hemorrhage gives a dilution of hemoglobin and proteins, while development of shock causes a rise in hemoglobin and no change in serum proteins. Severe cases of shock may require as much as 1000 c.c. of plasma or 250 c.c. of four times concentrated plasma every hour or two for eight hours. Isotonic crystalloid solutions and dilute plasmas are of very transitory benefit and the isotonic salines may lead to death in pulmonary edema.

General Rules

The uncomplicated case requires at least 2500 c.c. of fluid per day for water balance. If given parenterally this should be 1000 c.c. of isotonic saline and 1500 c.c. of isotonic dextrose in water.

After fever or profuse sweating this should be increased at least another 1000 c.c., preferably of the sugar solution.

After vomiting or gastric drainage the excess volume lost should be replaced by an equivalent volume of isotonic saline.

After diarrhea the excess volume excreted should be compensated by 1000 c.c. or more of isotonic saline or 500 c.c. of an alkaline solution and the balance of saline.

Hypertonic solutions should be used exclusively to relieve cerebral or pulmonary edema. They have no place in the treatment of dehydration.

Whole blood should be given only when extra red blood cells and hemoglobin, antibodies or platelets which disappear in stored plasma, or fibrinogen for clotting, are needed.

For the prevention of shock concentrated plasma or plasma should be given in amounts sufficient to keep hemoglobin or red count from rising. If plasma is not available hypertonic solutions of dextrose or sodium chloride are of some help, dextrose being somewhat better than saline.

When shock is present large amounts of concentrated plasma or plasma are needed to restore blood volume. Crystalloid solutions are of little value in shock once it has developed.

Give fluids by mouth, by rectum and by clysis whenever this can be done.

More important than the decision to give fluids, is the decision of *what kind of fluid* and *how much to give*.

References

1. Peters, J. P.—Body Water. The Exchange of Fluids in Man. Chas. C. Thomas, Baltimore, 1935.

2. Best, C. H., and Taylor, N. B.—The Physiological Basis of Medical Practice. 2nd Edition. Williams and Wilkins, Baltimore, 1940.

3. Coller, F. A., Dick, V. S., and Maddock, W. G.—Maintenance of normal water exchange with intravenous fluids. J. A. M. A. *107,* 1522, 1936.

4. Helwig, C., Schutz, C. B., and Drury, D. E.—Water intoxication. J. A. M. A. *104,* 1569, 1935.

5. Peters, J. P., and Van Slyke, D. D—Quantitative Clinical Chemistry. Interpretations. Williams and Wilkins, Baltimore, 1931.

6. Gibson, J. G. 2nd.—The clinical significance of the blood volume. Ann. Int. Med. *14,* 2014, 1941.

7. Moon, V. H.—Shock and Related Capillary Phenomena. Oxford University Press, New York, 1938.

8. McClendon, J. F., Cavett, J. W., and Johnson, R.—Prolonged rectal feeding. J. Lab. and Clin. Med. *22,* 1000, 1937.

9. Tocantins, L. M., O'Neill, J. F., and Price, A. H.—Infusions of blood and other fluids via the bone marrow in traumatic shock and other forms of peripheral circulatory failure. Ann. Surg. *114,* 1085, 1941.

10. Davis, H. A. and Eaton, A. G.—Bovine serum albumin as a substitute for transfusion of blood. Proc. Soc. Exper. Biol. and Med. *49,* 20, 1942.

11. Cohn, E. J.—The properties and functions of the plasma proteins, with a consideration of the methods for their separation and purification. Chem. Reviews *28,* 395, 1941.

12. Gordon, H., Hoge, L. J., and Lawson, H.—Gelatin as a substitute for blood after experimental hemorrhage. Am. J. Med. Sci. *204,* 4, 1942.

THE RHODE ISLAND MEDICAL JOURNAL
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It would be well, I think, if the surgeon would fix upon his memory, as the first professional thought which should accompany him in the course of his daily occupation, this physiological truth that Nature has constant tendency to repair the injuries to which her structures may have been subjected, whether those injuries be the result of fatigue or exhaustion, of inflammation or accident. Also that this reparative power becomes at once most conspicuous when the disturbing cause has been removed: thus presenting to the consideration of the physician and surgeon a constantly recurring and sound principle for his guidance in his professional practice.

Hilton . . . Rest and Pain

COLD HOUSES

If we don't cheat on our fuel we are most of us going to live in what we will consider cold houses this year. But of course, nowhere in the world or recorded history has the standard for a cold house been so high as here. Finely made antique furniture which has kept in good condition for a century or two has racked to pieces in atmospheres formerly found only in kilns. We have developed a taste for kiln life. Thirty-five or forty years ago one or two husky youths went through our college wearing B.V.D.'s all winter. How we marveled at their Polar Bear nature. Now few young men could contemplate with equanimity a call in a modern parlor wearing long warm drawers. And what our young women wear (or don't) modesty forbids us to contemplate.

Almost no occupied dwellings, we presume, have any worth while method of adjusting the humidity. The higher the temperature, the dryer the air. This is unfortunate for the limits of comfortable temperature are narrowed by humidity. Returning from the dry comfortable zero temperature of Northern New Hampshire one shivers at 30 degrees in the damp Providence air. In the dog days of August, "it isn't the heat it's the humidity".

Our outdoor air usually has considerable moisture in it, but we keep our rooms practically hermitically sealed because of our intense fear of "drafts". It is rare to find either laymen or doctors whose casual conversation does not indicate a morbid fear of moving air.

It is useless to point out that people who live in the most typical conditions for "catching cold", according to popular concepts, have the least colds. We are told that Arctic and Antarctic explorers do not have colds till the return to civilization. Samuel Johnson and Boswell, on their tour of the Hebrides, philosophized on the fact that the inhabitants of St. Kilda had colds only when the people of the mainland could, with their crude sailing craft, get through the wild tides of that coast to reach these outlanders who in their damp drafty dwellings were free from colds till their more fortunate friends came from the comforts of civilization bearing the infection. Already there are dark forebodings as to the effect on the public health of these "cold" houses. The A.M.A. has a committee to study the problem. Their task is a difficult one. As often happens in medicine there are so many interrelated factors that one can be skeptical as to whether well-founded conclusions can be drawn.

It would seem reasonable to believe that a resort to warmer clothing would certainly help to maintain comfort and avoid whatever dangers are attached to chilling the body. The growing interest in winter sports has taught many young people

that snuggies, woolen socks and heavier suits can be comfortable apparel.

It is true that "fashion is spinach" but proper slogans as "Jolt the Japs with Jaeger Wear" or "Help hit Hitler with Homespun" may convince our conservatory dwelling people that summer and winter call for different costumes.

Let us hope that our coal burning friends do not presume on their lack of rationing to keep their houses hotter. If we dress for 65 degrees we will suffer when we find ourselves at 75 degrees.

There is a growing field of thought that the free association with people suffering from colds is a source of more danger than the much feared drafts. We suggest that people with colds should isolate themselves and not feel they are sissies to stay at home a few days.

May we not hope that if we dress warmly and do not pass around our colds we may still be healthy with "cold houses"?

LETTER TO THE EDITOR

Dear Dr. Chase:

I have received a request from the Rhode Island Funeral Directors' Association for the assistance of this department in appealing to the physicians and hospitals of this State to cooperate with the funeral directors in the signing of death certificates.

Apparently several members of that Association complained that in some instances it was necessary for them to make three or four trips to a physician's office before it was possible to obtain his signature on the certificate.

The funeral directors feel that in view of the current scarcity of gasoline, rubber and personnel that it would be helpful if these physicians would be a little more considerate.

I am passing along their request to you with the idea that it might be possible for you to insert a brief appeal for such cooperation by the physicians in the RHODE ISLAND MEDICAL JOURNAL. I am sure that any assistance that you may be able to render will be appreciated by the funeral directors.

Very truly yours,

THOMAS B. CASEY, *Chief*
Division of Examiners
Rhode Island Department of Health

RHODE ISLAND MEDICAL SOCIETY

Report of the Committee on Problems due to the Shortage of Physicians presented to the House of Delegates, Sept. 17, 1942.

As your committee sees it, it is the duty of the Rhode Island Medical Society to lead in cooperation with all agencies which are for the betterment of our individual and collective attack upon problems arising in the medical care of our civilians during the war emergency. More specifically, it is our duty

First, to gather useful information, to coordinate our aims and forces and plan some program of prevention of, or attack upon, problems arising out of the limitation of doctors in our state.

Second, to make suggestions and be generally helpful in any way possible to:

(a) The remaining *individual physicians of the state* and

(b) The *various district societies.*

In the latter instance, to turn over such information and suggestions as are deemed in their interests to be acted upon by the various district societies as they see fit.

Third, to make these efforts more effective, by requesting the fullest cooperation of individual physicians and district societies.

As the duties of this committee are so closely related to the functions of the State Procurement and Assignment Committee, we need close cooperation and advice from Dr. Halsey DeWolf and his committee.

Recommendations concerning alien physicians.

(a) We need an open-minded position on this subject. More information is sought. Dr. Beale, secretary of the committee for resettlement of Foreign Physicians has promised to send a report to Dr. Gormly. He also informed Dr. Gormly that 3000 of the best of 6000 alien doctors are now placed.

Any recommendations or positions taken on this subject should be in cooperation with the State Director of Health and the Chairman of the Board of Medical Examiners.

(b) The committee approves of the use of salaried alien physicians in institutions (state or private) where such institutions, due to emer-

gency shortage of registered physicians, require their services for the proper care of those confined.

At the present time the State Institutions at Howard are employing four Alien Physicians—three at the State Mental Hospital and one at the State Infirmary and the services of others are sought. There are also a small number in private institutions.

It is suggested, however, that these institutions record with the State Board of Health, if not already done, such salaried physicians when taken into employ, and at such further intervals as the law requires.

(c) With respect to aliens in private practice, it is felt by the committee that no medical emergency now exists and that there is no lack of medical care that would necessitate encouraging the introduction of alien physicians into private practice in Rhode Island except through natural channels.

In considering the various angles of this prob-
to Rhode Island physicians not in service asking

(1) We must not let down our medical standards built up so carefully over the past years. These standards are a safe-guard in the interests of our citizens.

(2) We are very conscious of our great responsibility ahead in properly looking after the health of our citizens. They must not be allowed to suffer lack of adequate medical care. To this end, the committee is formulating ways and means of effectively meeting the problem. We must expect that we physicians not in service will be burdened and must sacrifice also as our part in the war.

(3) We must also guard the interests of the hundreds of physicians in service and of their patients whom they have left in our trust. We owe them this much for their sacrifice.

Recommendations concerning the committee for the purpose of creating and utilizing our greatest efficiency in the care of our civilian population.

(a) Two large maps should be posted at the Medical Library and kept up to date — one of the Providence District and one of Rhode Island. These maps to show by pins location of all physicians, members and non-members of Medical Societies, who are not in service or full time government employees. It is suggested that the pins be placed at home addresses. Details such as explanatory lists, etc., can be worked out later. The Rhode Island Society is already much indebted to Mr. John Farrell, executive secretary of the Providence Medical Association for the time he has devoted to some of our problems. He has consented to try to work out this.

(b) It would seem to the committee that there should be enforced yearly registration of doctors in Rhode Island again, for this is an important matter that concerns the profession and State. We now find it unfortunate that we have no such registration. It is difficult to find out who is practicing and who is not or who has moved out of the State or recently come in.

(c) A brief questionnaire could be sent out to Rhode Island physicians not in service asking whether or not they are members of District or State Societies and requesting such information as is found to be necessary.

(d) It is also recommended that various districts or sections of districts be covered by a telephone that can be reached at any hour by anyone in an emergency and unable to get a doctor and that such stations be given names of available doctors and be kept informed.

(e) It is further suggested that:

(1) The *Providence Medical News* again publish their useful map found in the September 1941 number with such changes and additions as seem wise, preferably including the whole Providence District.

(2) The RHODE ISLAND MEDICAL JOURNAL publish a similar map for the state showing locations of active and available physicians, etc., with home addresses.

(f) For the purpose of understanding and of coordination between public and the profession, there should be periodic press releases and radio talks and posters giving general information and advice.

(g) Sectional coverage of patients by local doctors for those unable to get their own physician many miles away will often be practical. This already has been emphasized.

There are many other problems to be solved, such as the care of the city poor. (This should be in conference with Drs. Nestor and Hindle. Should alien physicians be used, etc.?)

In conclusion, it is the feeling of the committee that the home physicians are faced with a tremendous task. Putting our shoulders to the wheel in cooperation one with another is the only way we can stave off a real medical emergency. Information, organization and cooperation is the only formula to meet effectively the responsibilities that we are undertaking in supplying adequate medical care to our civilians.

We are going to face criticism and adverse reports from many isolated sources. We must respect public opinion and be as tolerant as we can and at the same time ask the public including our patients to be considerate with us. More can be accomplished by diplomacy and patience than by irritation and resentment, especially during this struggle for the preservation of our liberties.

Respectfully submitted,

DR. ALFRED L. POTTER
DR. CHARLES J. ASHWORTH
DR. ELIHU S. WING, *Chairman*

PROVIDENCE MEDICAL ASSOCIATION

A regular meeting of the Providence Medical Association was held at the Medical Library on Monday, October 5, 1942. The meeting was a joint meeting with the Rhode Island Children's Heart Association.

The Executive Secretary reported for the Executive Committee as follows:

That a motion was passed that "members of the Providence Medical Association serving with the armed forces of the United States shall be exempt from the assessment of annual dues during their period of service."

That a motion was passed that "the executive committee approves the action of the Committee on Credit and Collection in cancelling the Association's affiliation with the Medical Clearing Bureau of Providence in view of the fact that the original agreement between the two parties has failed to achieve its purpose to provide special credit and collection service to the membership."

The President called upon Dr. Emanuel W. Benjamin, chairman of the Committee on Credit and Collection for discussion of the work of his committee. Dr. Benjamin reported briefly on the reason for the recommendation of the cancellation of the affiliation with the Medical Clearing Bureau and he stated that the action in no way cast any reflection on the integrity of the Medical Clearing Bureau.

The report of the Executive Committee was accepted.

The following doctors were elected to membership: F. Temple Burling, M.D., Francis H. McCaffrey, M.D., Gustavo A. Motta, M.D.

The President reported that five of our members had died since the previous meeting of the Association, and at his request Dr. George S. Mathews and Dr. Dennett L. Richardson have prepared the obituary tribute to Dr. Fred N. Brown; and that to prepare the obituary tribute to the other deceased members he was asking Dr. John E. Donley and some doctor of his choice to prepare the tribute of Dr. Patrick H. Keefe; Dr. William Shields and Reginald A. Allen to prepare the tribute to Dr. Thomas A. Martin, the first member to die in military service in World War II; Dr. Charles Cooke and Dr. Louis A. Sage to prepare the tribute to Dr. Richard L. Shea; and Dr. Herbert H. Armington and Dr. Edmund D. Chesebro to prepare the tribute to Dr. Charles N. Raymond who was our oldest active member until his death.

The President also announced the appointment of a Committee to join with a similar committee of the State Medical Society in a study of the new Rhode Island Cash Sickness Compensation Act. The Committee named consisted of the following: Emery M. Porter, M.D., Herman C. Pitts, M.D., William H. Foley, M.D., Henry A. Jones, M.D., Henry E. Utter, M.D.

The President turned the chair over to Dr. Banice Feinberg, president of the Children's Heart Association who presided over a brief meeting of that group.

President Utter then briefly discussed the objectives of the Children's Heart Program and presented the panel for the discussion of the topic "Rheumatic Fever". The members of the panel were William P. Buffum, M. D., Harold G. Calder,

M.D., Francis V. Corrigan, M.D., Banice Feinberg, M.D., and John C. Ham, M.D.

Dr. Calder opened the discussion by describing in detail the clinical course and symptoms of rheumatic fever. This disease is public enemy number one so far as children are concerned as the mortality exceeds all other deaths in children from 5 to 15 years of age. Its cause is still unknown. It is endemic, especially in the temperate zone. Its incidence is rare under 3 years of age and apparently it is not contagious. There is a definite familial tendency. The commonest bacterial finding is the hemolytic streptococcus in the upper respiratory tract and the lesions in the body tissues are apparently caused by the toxins of the bacteria which cause sensitization of the tissues. Its onset is insidious and the most important laboratory findings are an increased white count and sedimentation rate. The heart is involved to some extent early in the disease and this is shown by enlargement, increased rate, and finally murmurs. Recovery takes place from the first attack but recurrences are common every one to two years over a period of about 8 years.

Dr. Ham spoke of the value of the electrocardiograph in rheumatic fever and emphasized that the tracings would be exactly like those found in any heart disease so that the electrocardiograph was only an aid taken in conjunction with all the other findings, useful not so much in diagnosis of the disease as in following the course with serial tracings. Perhaps the one most important finding in this connection is the P-R interval which is definitely increased during involvement of the myocardium. Also serial tracings might well pick up a recrudescence before other signs or symptoms develop. He emphasized that we should realize the limitations of electrocardiography in rheumatic fever.

Dr. Feinberg gave a complete and interesting summary of the treatment of this disease, going into the care with which the rheumatic child and later the cardiac child, must be surrounded if good results are to be obtained. Rest, good food, Vitamins, control of anemia, elimination of possible infectious foci, and good surroundings must be maintained for long periods of time until all clinical and laboratory findings show inactivity of the disease. He emphasized that in the treatment of the active phase Sulfonamides had proved worthless and that the symptomatic treatment in the form of Salicylates in saturation doses of about 1 gr. per pound body weight should be given until pain and fever have subsided. The only instance in which the Sulfonamides might be used to advantage was in giving small doses of Sulfanilamide before the removal of tonsils and adenoids. He felt that the experiments on giving Sulfanilamide in small doses during the season of greatest incidence of upper respiratory infections had not as yet proved of value. For some of the complications occurring during rheumatic fever, such as chorea, Phenobarbitol has proved most useful. The criteria for T. & A. was the same as in the non-rheumatic child.

Dr. Buffum took up the interval management, emphasizing that the convalescent home or hospital was by far the best place to treat the rheumatic child because there one could attain the best living conditions from the point of view of health, both physical and mental. The rigid control of activity could be carried out successfully and respiratory infection could be reduced to a minimum. As to the possibility of change in environment doing good; for example sending the child to a southern climate, he thought this was an excellent procedure but a financial impossibility in most cases as rheumatic fever is definitely a low income group problem.

The last speaker was Dr. Corrigan who gave a short summary of the State program. He told about the out patient clinics which had been established; the first one in Pawtucket Memorial Hospital in December 1941 which is conducted once a month; another at the Chapin Hospital which was opened on the same basis but because of the large number of cases, now is conducted once a week; a third is planned for the Woonsocket Hospital. These clinics are primarily a diagnostic service to the private physician who may refer cases of rheumatic fever. The clinic does all the laboratory procedures and tries to give the physicians referring the case an idea of the condition of the patient. A few cases who are definitely unable financially to handle the care and treatment may have hospital and convalescent care, the bill being paid by the State.

Members who entered in the discussion following the presentation of the subject were Doctors Frank Fulton, Clifton B. Leech, Francesco Ronchese.

COMING MEETINGS

AMERICAN COLLEGE OF SURGEONS

ANNUAL CONGRESS SCHEDULED FOR CLEVELAND, NOVEMBER 17 TO 20

The 1942 Clinical Congress of the American College of Surgeons, originally scheduled for October at the Stevens Hotel, Chicago, which was taken over August 1 by the United States Army Air Corps, will be held in Cleveland, with headquarters at the Cleveland Public Auditorium, from November 17 to 20. The twenty-fifth annual Hospital Standardization Conference sponsored by the College will be held simultaneously.

The program of both meetings will begin with a Joint General Assembly on Tuesday morning, November 17, with addresses by Surgeon General James C. Magee of the Medical Corps, United States Army; Surgeon General Ross T. McIntire of the Medical Corps, United States Navy; Surgeon General Thomas Parran of the United States Public Health Service; Lieutenant Colonel George Baehr, Chief Medical Officer of the United States Office of Civilian Defense; Dr. Frank H. Lahey, Chairman Directing Board, Procurement and Assignment Service; Dr. Irvin Abell, Chairman of the Board of Regents of the College and Chairman of the Health and Medical Committee of the Federal Security Agency; and Dr. W. Edward Gallie of Toronto, President of the College. The surgeons general and Colonel Baehr will also speak at the Presidential Meeting and Convocation the same evening.

THE NATIONAL FOUNDATION FOR INFANTILE PARALYSIS 120 BROADWAY, NEW YORK

The Third Annual Medical Meeting of the National Foundation will be held in New York City on December 3-4 inclusive.

BOOK REVIEWS

ADVANCES IN INTERNAL MEDICINE, J. Murray Steele, M. D., Editor. Interscience Publishers, Inc.

This book represents Volume I in a series to be published from time to time of recent advances in internal medicine. It is a small volume of 292 pages with ten different subjects presented by as many authors. Most of these writers have made valuable original contributions in their special fields. Each subject discussed represents a thorough review of a particular branch of internal medicine rather than a presentation of isolated recent advances.

W. Osler Abbott discusses in great detail and with considerable clarity "The Use of the Miller-Abbott Tube in the Diagnosis and Treatment of Disorders of the Gastro-Intestinal Tract." The newer aspects of "Hypertension with a Review of Humoral Pathogenesis and Clinical Treatment" is another article that affords a thorough and timely if somewhat theoretical discussion of an important problem. Probably the most practical and valuable subject is Chester S. Keefer's "Choice of the Sulfonamides in the Treatment of Infections." The author gives a detailed plan for the therapy of all infectious diseases with various sulfonamides from both clinical and experimental aspects.

The remaining articles in the volume cover various aspects of the broad field of medicine from the point of view of the individual contributor. The choice of the subjects might be questioned in some cases on the ground that very little of the material represents a recent advance. Certainly, other subjects might be of greater interest to the average internist and involve more important and more recent progress.

As future editions are published the series should be a valuable addition to the library of any physician interested in internal medicine.

WILLIAM FAIN, M.D.

ADVANCES IN PEDIATRICS — Volume I, 1942. Adolph G. DeSanctis, M.D., Editor. Interscience Publishers Inc., New York, N. Y. 291 Pages.

This is not, as the title might suggest, a collection of abstracts from the current magazines. On the contrary, the editor has selected the subjects in which he thinks significant contributions to our knowledge have been made, and has asked authorities in these fields to write articles on these subjects, bringing them up to date. You do not get the impression of reading a rehash of what you have read before. The articles are new, refreshing, interesting and instructive.

The main topics treated in this column included Toxoplasmosis, Virus Disease, Chemotherapy, Electroencephalography, Vitamin K, Persistent Ductus Arteriosus, Prematurity, Tuberculosis and Endocrinology.

They are all well handled but Toxoplasmosis by Dr. Albert B. Sabin might be given special praise. It covers 56 pages and furnishes an exhaustive description of this new and little-known disease. Nothing like it has appeared before.

Electroencephalography by Dr. Norman I. Brill is very well done. Many physicians do not realize the progress that has been made in the diagnosis of intracranial lesions and behavior problems by this relatively new method.

In the article on the Premature Infant by Dr. Abraham Tow, not all Pediatricians will agree that whole milk mixtures are as good as breast milk or evaporated milk. Nor will they agree that the premature infant should be given coddled egg at 3 months, whole milk at 4 months, and meat and desserts at 6 months. This would seem to represent the personal views of the author. He states that "all the orthodox mixtures in common use may be suitable" and that the important thing is to be able to treat "vomiting and diarrhea when they occur". The important thing is to keep them

from occurring. The rest of his article, however, is excellent.

All pediatricians will enjoy and profit from reading this book and it ought to be especially valuable to general practitioners who do not get the opportunity to read the pediatric magazines. It is hoped that this new idea will be successful and that other volumes will be forthcoming. Volume I is recommended with enthusiasm.

HAROLD G. CALDER

CLINICAL ANESTHESIA: By John S. Lundy, B.A., M.D., Head of Section on Anesthesia, Mayo Clinic; Professor of Anesthesia, Mayo Foundation for Medical Education and Research, Graduate School, University of Minnesota. W. B. Saunders Company, 1942. Price $9.00.

There have probably been more books published on anesthesia within the past few years than in any similar period in the history of this specialty.

In the main, these books have been confined either to a consideration of limited fields as Gillespie's "Endotracheal Anesthesia" or to a purely fundamental scope as "An Outline of Anesthesia" by the Anesthesia Committee of the National Research Council. There has long been a need for a volume such as Dr. Lundy presents in his "Clinical Anesthesia". Dr. Lundy offers a truly cyclopedic volume on anesthesia. He has attempted to cover much of the material that a qualified anesthetist should have at his fingertips. The book covers not only technical procedures involved in the administration of anesthesia but also other valuable procedures as Resuscitation, Intravenous Therapy, and Gas Analysis.

It is impossible for anyone to cover all fields of anesthesia thoroughly in one volume. The particular fields which Dr. Lundy covers with a great deal of success are Regional, Endrotracheal, and Intravenous Anesthesia.

It is manifest also that an author can not please everyone for it is this reviewer's opinion that too much valuable space and importance are devoted to the Barbiturates as anesthetics. Much of this space might have been devoted with profit to the further consideration of the pharmacologic basis of anesthesia. The principles and technique of Absorption Anesthesia may also have been further stressed.

Dr. Lundy, through the adroit use of tables gathers and presents to the reader much valuable information. This form of presentation is one of the highlights of the book and it is to Dr. Lundy's credit that it is a success.

Special attention is paid to postoperative care and other similar material. This is in line with recent thought and progress in anesthesia and is witness to the growth of the modern anesthetist away from the purely operating room technician.

This valuable volume contributes much to anesthesia literature.

It will find many readers among all students of anesthesia.

MEYER SAKLAD, M.D.

OPHTHALMOLOGY AND OTOLARYNGOLOGY, Military Surgical Manuals, National Research Council. W. B. Saunders Company—1942.

This manual is one of a series of texts prepared under the auspices of the Division of Medical Sciences of the National Research Council to present in compact form essential up to date and reliable information concerning military surgery. Since the burden of medical care of necessity will fall upon medical officers outside the highly specialized fields, only the simplest technics and treatments with drugs and instruments generally available are described.

In 300 pages of very readable type, an outline of the various technics of functional testing of the eye and ear is presented. Concise paragraphs on the diagnosis and emergency treatment of acute diseases and injuries of the eye, ear, nose and throat are included. The chapter on primary treatment of gun shot wounds of the face by Dr. Kasanjian is by the nature of the subject the longest and best illustrated in the manual.

Altho prepared primarily for the medical officers of the armed forces in the field, the general practitioner will find this a valuable outline for quick reference in emergencies occurring in civil life.

LEE G. SANNELLA, M.D.